भारतीय मानक

Indian Standard

IS 11356 (Part 1) : 2023

स्टाइरीन-ब्यूटाडाइन रबड़ लैटेक्स — विशिष्टि

भाग 1 नॉन-कार्बोक्सिलेटेड

(दूसरा पुनरीक्षण)

Styrene-Butadiene Rubber Latex — Specification

Part 1 Non-Carboxylated

(Second Revision)

ICS 83.040.10

भारतीय मानक ब्यूरो
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Rubber and Rubber Products Sectional Committee, PCD 13

FOREWORD

This Indian Standard (Part 1) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Rubber and Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was published in 1985 and subsequently revised in 2020 to update mainly cross referred standards. The type of latex, which was covered was commercially known S-2000 latex; this number was allotted by the International Institute of Synthetic Rubber Producers Inc., USA.

Styrene-butadiene latex is used for variety of purposes like tyre cord dipping, construction, textiles, compounding, adhesives for footwear and paper industry, carpet backings, upholstery and linings for proofed goods like firefighting hoses, etc.

Second revision of this standard is carried out to upgrade the standard with current trade practices and quality requirements. Based on the availability of carboxylated and non-carboxylated styrene-butadiene rubber latex, the Committee decided to bifurcate the standards, as given below:

Part 1 Non-Carboxylated
Part 2 Carboxylated

This Part 1 includes requirements of three types of non-carboxylated styrene-butadiene rubber latex based on the manufacturing process. Requirement of brookfield viscosity has been included and average particle size has been deleted. Scale of sampling and criteria of conformity has been modified. Amendment No. 1 has also been considered during the revision.

This revision also includes flexi container for the packaging, for which the method of drawing representative samples of the material and criteria for conformity has also been incorporated. Flexi container is a hermetic sealed, collapsible and flexible bag/bladder being used for the transportation and storage of non-hazardous liquid chemicals **s**uch as liquid detergents, lubricants, fertilizers, liquid latex, food items, paints etc. Flexi packaging is more beneficial to manufacturers for reducing transportation cost, packing cost, and reducing energy during packing or filling; to customers by offering convenient features that were not available in rigid packaging, thus enhancing sustainability.

The composition of the committee responsible for formulation of this standard listed in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 (*second revision*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

STYRENE-BUTADIENE RUBBER LATEX — SPECIFICATION

PART 1 NON-CARBOXYLATED

(Second Revision)

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for hot and cold polymerized non-carboxylated styrene-butadiene copolymer latex, emulsified with rosin acid and fatty acid soap emulsifier.

2 REFERENCES

The Indian Standards listed in Annex A contain provisions which through reference in this text constitute the provisions of the standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TYPE

Based on the manufacturing process, the non-carboxylated styrene-butadiene rubber latex shall be of the following three types:

a) Type 1 — Cold polymerized styrene-butadiene latex;
b) Type 2 — Hot polymerized styrene-butadiene latex; and
c) Type 3 — High solid content cold polymerized styrene-butadiene latex.

4 REQUIREMENTS

The material shall comply with the requirements given in Table 1, when tested as prescribed in col (6) and (7) of Table 1.

5 PACKING AND MARKING

5.1 Packing

The latex shall be packed as agreed to between the purchaser and the supplier.

5.2 Marking

The containers shall be marked with the following:

a) Name of the material;
b) Name of the manufacturer or trade-mark, if any;
c) Net and gross mass in kg;
d) Month and year of packing; and
e) Any other statutory requirements

5.2.1 For supplies of material in tankers or bulk packaging, a test report containing the following additional information shall be provided for each tanker:

a) Name of the material;
b) Name of the manufacturer or trade-mark, if any;
c) Net and gross mass in kg;
d) Month and year of packing;
e) Tanker number; and
f) Any other statutory requirements

The test report shall be certified by authorized person of the manufacturer’s organization.

5.2.2 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standard Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

6 SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

6.1 The method of drawing representative samples of the material and criteria for conformity shall be as prescribed in Annex D.

Table 1 Requirements for Non-Carboxylated Styrene-Butadiene Rubber Latex

(*Clause* 4.1)

Sl No.	Characteristic	Type			Method of Test, Refer to	
		Type 1	Type 2	Type 3	Annex	Indian Standard/Other Publication
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Total Solids, percent	39-42	40-42	60, *Min*	---	IS 9316 (Part 4)/ ISO 124[1)]
ii)	*p*H at 25 °C	10-12	10-12	10-12	---	IS 9316 (Part 6)
iii)	Surface Tension (Dynes/cm) at 25 °C	58-65	48-58	33-43	---	IS 9316 (Part 1)/ ISO 1409[2)]
iv)	Specific Gravity	0.96 - 1.0	0.96 - 1.0	----	---	IS 3104 (Part 2)
v)	Residual Styrene, percent by mass, *Max*	0.3	0.3	0.3	---	IS 4511 (Part 3)
vi)	Bound styrene, percent by mass	23-26	46-52	23-26	---	4511 (Part 4)
vii)	a) Brookfield Viscosity, *Max*, mPa.s, SP1, 12 RPM at 25 °C	100	100	--		IS 9316 (Part 2)/ ISO 1652[3)]
	b) Brookfield Viscosity, *Max*, mPa.s, SP2, 12 RPM at 25 °C	--	--	2 500	--	IS 9316 (Part 2)/ ISO 1652[3)]
viii)	Mooney Viscosity[4)], ML_{1+4} at 100 °C	70 -130	50 -90	70-160	B	----
ix)	Mechanical stability, coagulum percent by mass, *Max*	0.3	0.3	----	C	
x)	Coagulum content, percent by mass, *Max*,	0.1	0.1	0.1	---	IS 9316 (Part 3)/ ISO 706[5)]

[1)] In case of dispute, ISO 124 shall be the referee method for the determination of total solids.
[2)] In case of dispute, ISO 1409 shall be the referee method for the determination of surface tension.
[3)] In case of dispute, ISO 1652 shall be the referee method for the determination of brookfield viscosity.
[4)] In case, the Mooney Viscosity is very high, the small rotor shall be used and result shall be expressed in MS_{1+4} at 100 °C.
[5)] In case of dispute, ISO 706 shall be the referee method for the determination of coagulum content.

ANNEX A
(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No./Other publication(*s*)	*Title*
IS 1070 : 1992	Reagent grade water — Specification (*third revision*)
IS 3104 (Part 2) : 1982	Specification for density hydrometers Part 2 Methods of test and use (*first revision*)
IS 3660 (Part 7) : 2013/ISO 289-1 : 2005	Methods of test for natural rubber: Part 7 Determination of mooney viscosity (*third revision*)
IS 4511	Methods of test for styrene-butadiene rubber (SBR) latices
(Part 3) : 1987	Determination of volatile unsaturates (*first revision*)
(Part 4) : 1986	Determination of bound styrene (*first revision*)
IS 9316	Methods of test for rubber latex
(Part 1) : 1987	Determination of surface tension (*first revision*)
(Part 2) : 1987	Determination of viscosity (*first revision*)
(Part 3) : 1987	Determination of coagulum content (sieve residue) (*first revision*)
(Part 4) : 1988	Determination of total solids content (*first revision*)
(Part 5) : 2013 /ISO 123 : 2001	Drawing of samples (*second revision*)
(Part 6) : 2017 /ISO 976 : 2013	Determination of *p*H (*second revision*)
ISO 124 : 2014	Latex, rubber — Determination of total solids content
ISO 706 : 2004	Rubber latex — Determination of coagulum content (sieve residue)
ISO 1409 : 2020	Plastics/rubber — Polymer dispersions and rubber latices (natural and synthetic) — Determination of surface tension
ISO 1652 : 2011	Rubber latex — Determination of apparent viscosity by the Brookfield test method

ANNEX B

[*Table* 1, *Sl No.* (viii)]

DETERMINATION OF MOONEY VISCOSITY

B-l OUTLINE OF THE METHOD

The rubber portion of a latex is separated by a salt-acid methanol coagulation, dried and massed on a mill. The viscosity of the rubber is measured on a Mooney viscometer.

B-2 APPARATUS

B-2.1 High Speed Agitator — waring blender or similar blender

B-2.2 Drying Trays — 30 cm × 20 cm × 2.5 cm with coarse screen bottom

B-2.3 Draft Oven — capable of maintaining (120 ± 5) °C.

B-2.4 Laboratory Mill

B-2.5 Mooney Machine — with large rotor

B-3 REAGENTS

B-3.1 Sulphuric Acid — 18 percent (*v/v*)

B-3.2 Sodium Chloride Solution — 10 percent (*m/v*).

B-3.3 Styrenated Phenol — 0.75 parts per hundred parts of rubber (phr)

B-4 PROCEDURE

B-4.1 Dilute the total solids content of the latex with distilled water to approximately 30 percent. Add to 250 ml of the diluted latex, 50 ml of the 10 percent sodium chloride solution and mix thoroughly. Stir the creamed latex in a waring blender and add 250 ml of phenyl beta naphthylamine solution in 50 s to 60 s. Continue agitation for 2 min to 3 min. During this period slowly add 10 ml of 18 percent sulphuric acid. If the coagulating solution does not turn Congo red paper from red to blue, add additional sulphuric acid while stirring until the colour does change.

B-4.2 Pour the contents in the coagulating cup on cheese cloth and allow the mass to drain. Press as much serum as possible from the mass. Pull the mass apart, wash thoroughly, till free of acid and transfer the pieces to a drying tray. Keep it for about an hour before determining the Mooney viscosity.

B-4.3 Dry the crumb in a draft oven at (120 ± 5) °C for approximately 45 min. Mill mass the rubber and determine between 10 min to 30 min Mooney viscosity as given in IS 3660 (Part 7)

ANNEX C

[*Table* 1, *Sl No*. (ix)]

DETERMINATION OF MECHANICAL STABILITY

C-1 GENERAL

C-1.1 The test method given below specifies for the determination of the high-speed mechanical stability of synthetic rubber latex. The test is applicable to synthetic rubber latices which have a viscosity, determined with the *L* instrument in accordance with IS 9316 (Part 2) of up to 200 mPa s (200 cP). Latices of higher viscosity shall be tested after dilution to a viscosity of 200 mPa.s (200 cP) or less, provided that such dilution does not reduce the concentration of the latex by more than 10 percent total solids.

NOTE — Dilution of the latex decreases its stability because the balance of free and absorbed soap is changed.

C-1.2 The duration of stirring shall be so selected that the latex does not increase in temperature to more than 60°C and does not exceed a height of 100 mm in the latex container. The duration of stirring shall be as agreed to between the purchaser and the supplier and shall not be longer than 30 min or less than 1 min. In the case of a latex which contains ammonia, the duration of stirring shall be limited, since loss of ammonia by evaporation during the test may cause additional destabilization.

C-1.3 The test does not necessarily indicate the stability of a synthetic rubber latex to high shear stress, for which a rubbing test may be more applicable.

C-2 OUTLINE OF THE METHOD

C-2.1 The amount of coagulum formed after stirring of the latex at high speed, is regarded as an inverse measure of the mechanical stability of the latex.

C-3 REAGENT

C-3.1 Soap Solution — 5 percent solution of potassium oleate of *p*H value 10, or, for use with a latex which is coagulated by potassium oleate

solution, 5 percent solution of a synthetic anionic surfactant.

C-3.2 Distilled Water — (*see* IS 1070)

C-4 APPARATUS

C-4.1 Mechanical Stability Measuring Apparatus — consisting of the following items

C-4.1.1 *Latex Container* — flat bottomed cylindrical, at least 100 mm high, with an internal diameter of (58 ± 2) mm. The inner surface shall be smooth, and a glass container is preferred.

C-4.1.2 *Stirring Apparatus* — consisting of a vertical stainless steel shaft of sufficient length to reach to the bottom of the latex container (**C-4.1.1**) and tapering to 6.35 mm diameter at its lower end, where is attached a horizontal, smooth, stainless steel disk (36.12 ± 0.03) mm in diameter and (1.58 ± 0.05) mm thick by means of a threaded stud at the exact centre of the disk. The apparatus shall maintain a stirring speed of (14 000 ± 200) rev/min throughout the test, at which speed the shaft shall not run out of true by more than 0.25 mm.

C-4.1.3 *Holder* — for the latex container (**C-4.1.1**). The holding arrangement shall ensure that the axis of the rotating shaft is concentric with that of the latex container and that the bottom of the stirring disk is (13 ± 2) mm from the inner surface of the bottom of the latex container.

C-4.2 Preliminary Filter — of stainless steel wire cloth with an average aperture width of (180 ± 15) µm

C-4.3 Test Filter — consisting of a disk of stainless steel wire cloth with an average aperture width of (180 ± 15) µm, dried to constant mass and weighed to the nearest 1 mg, firmly clamped between two stainless steel rings of equal internal diameter between 25 mm and 50 mm

C-5 PROCEDURE

C-5.1 In case viscosity of the latex determined with the *L* instrument [according to IS 9316 (Part 2)] exceeds 200 mPa.s (200 CP), dilute it to this or a lower value, with an amount of water which reduces the concentration of the latex by not more than 10 percent total solids.

C-5.2 Adjust the temperature of the latex to (25 ± 3) ºC, pass it through the preliminary filter (**C-4.2**) and transfer (50 ± 0.5) g to the latex container. Place the container (**C-4.1.1**) in position and stir the latex at (14 000 ± 200) rev/ min for 30 min, such that the latex does not increase in temperature to more than 60 °C and does not exceed a height of 100 mm in the container. If it is necessary to limit foaming, a paste of a silicone defoamer shall be smeared around the upper portion of the inner surface of the container. Immediately after the termination of stirring, remove the latex container and wash the stirrer shaft and disk free from latex deposits with soap solution. Wet the test filter (**C-4.3**) with soap solution and pour the latex and washings into the test filter. Use soap solution to ensure quantitative transfer of all latex and deposits including skin. Wash the residue on the test filter with soap solution until it is free from latex and then with water until the washings are neutral to litmus. Carefully remove the test filter containing the wet solid matter and swab the underside with filter paper. Dry the test filter and coagulum at (100 ± 2) °C until the change in mass is less than 1 mg during 15 min drying.

C-6 EXPRESSION OF RESULTS

C-6.1 The high-speed mechanical stability of the latex shall be reported as the percentage of coagulum which is formed. Calculate it as a percentage by mass of the latex, using the formula:

$$\text{Coagulum, percent by mass} = \frac{M_1 \times 100}{M_0}$$

where

M_o = mass in g, of the test portion; and
M_1 = mass in g, of coagulum.

ANNEX D
(*Clause* 6)

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

D-1 TANK SUPPLIES

D-1.1 When the material is supplied in tanks or other bulk containers, each tank or bulk container shall be sampled separately.

D-1.2 A representative sample shall be drawn from each tank of bulk container, from top and bottom, according to IS 9316 (Part 5).

D-1.3 The sample shall be tested for all the requirements given in Table 1. The material in tank or bulk container shall be considered as conforming to this specification, if the corresponding representative sample satisfies all the requirements given in the specification.

D-2 DRUM SUPPLIES

D-2.1 Lot

All the drums, in a single consignment, of the same size and belonging to same batch of manufacture shall constitute a lot.

D-2.2 The number of drums (*n*) to be selected for sampling shall depend on size of the lot (*N*) and shall be as agreed between the purchaser and the supplier.

D-2.3 From each of the drums selected according to **D-2.2**, a representative sample shall be drawn in accordance with the procedure prescribed in IS 9316 (Part 5).

D-2.4 For ascertaining the conformity of material to the requirements of this specification samples shall be tested from each lot separately.

D-2.5 The lot shall be declared as conforming to the specification, if the corresponding representative sample satisfy all the requirements given in the specification.

D-3 FLEXI SUPPLIES

D-3.1 When the material is supplies in flexi container, each flexi container shall be sampled separately.

D-3.2 A representative sample shall be drawn from each flexi container during loading of the material from filter attached to loading hose.

D-3.3 The sample shall be tested for all the requirements given in Table 1. The material in flexi container shall be considered as conforming to this specification, if the corresponding representative sample satisfy all the requirements given in the specification.

D-4 TEST SAMPLE AND REFEREE SAMPLE

D-4.1 After testing and conforming the material to the specification, the referee sample shall be kept. These samples shall be used in case of any dispute between the purchaser and the supplier.

ANNEX E
(*Foreword*)

COMMITTEE COMPOSITION
Rubber and Rubber Products Sectional Committee, PCD 13

Organization	*Representative*(*s*)
Rubber Research Institute of India, Rubber Board, Kottayam	DR SIBY VARGHESE **(*Chairperson*)**
All India Rubber Industries Association, Mumbai	SHRI SRIKANTH KRISHNAMURTHY SHRI CHINMOY RAY (*Alternate*)
Apcotex Industries Ltd	DR S. V. GOVINDRAJU
Association of Latex Producers of India, Kerala	SHRI SATISH ABRAHAM
Association of Planters of Kerala, Thiruvananthapuram	SHRI SANTOSH KUMAR SHRI PHILIP C. JACOB (*Alternate*)
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